DEPARTMENT OF ENERGY SCİENCE AND TECHNOLOGY
COURSE SYLLABUS

Course Details				
Code	**Academic Year**			**Semester**
EBT204	2			4
Title	**T**	**A**	**L**	**ECTS**
Thermodynamics	3	2	0	6

Language	German					
Level	**Undergraduate**	**X**	**Graduate**		**Postgraduate**	
Department / Program	Energy Science and Technology					
Forms of Teaching and Learning	Face to Face					
Course Type	**Compulsory**	**X**	**Elective**			
Objectives	At the end of the course, students; They will have the basic knowledge of thermodynamics. They have the ability to think abstractly in physical models and thus evaluate the basic processes of thermodynamics. During the course, students gain 60% knowledge and 40% analysis and methodology skills.					
Content	● Units of measurement used in Thermodynamics with the Mks unit system, the first law of Thermodynamics, thermodynamic systems, establishing energy conservation equations by classifying open and closed systems, defining enthalpy and volume change work and showing them on the p-v diagram. ● Entropy and the second law of Thermodynamics, concept of reversibility, T-s diagram ● Thermodynamic properties of gases and liquids, ideal gas equation and its application ● Carnot Cycle, Exergy – Anergy, definition and calculation of exergic efficiency ● Real Gas: Real gas equations, use of steam tables, calculation of calorific values of wet steam and displaying them on the Ts diagram ● Ideal gas mixtures: Determination of thermodynamic properties of ideal gas mixtures and their specific heat, enthalpy and internal energy ● Humid air: Calculation of properties, enthalpy and specific volume of moist air, which is an ideal gas mixture ● Compressors: Structure and working principle of Reciprocating and Turbo Compressors, showing compression processes and specific work and heat in the T-s Diagram, definition and calculation of various compression efficiencies (isothermal and isentropic efficiencies) ● Turbines: Structure and working principle of turbines, showing expansion processes and specific work and heat in the T-s Diagram, definition and calculation of various efficiencies (isentropic efficiencies) ● Combustion: Determining the reaction coefficients of fuel-air mixtures in stoichiometric combustion, determining the content and temperature of exhaust gases depending on the excess air coefficient. ● Gas-power cycles: Joule-Brayton cycle and calculation of the power and efficiency of this cycle, shown on the Ts diagram ● Steam-power cycles: Calculating the power and efficiency of this cycle with the Clasius-Rankine cycle, showing it on the Ts diagram, calculating the total efficiency of the gas-steam combined cycle power plants by showing their flow chart sketches and cycles on the Ts diagram. ● Coolers and heat pumps: Definition of the cooling-heating power and efficiency (performance, COP) coefficient of the Reverse (left-hand) Rankine cycle, which is a steam-					

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	cooling cycle, and the Gas-cooling cycle (Philips-Sterling), showing it on the T-s diagram, double-stage Reverse Rankine cycle
Prerequisites	None
Coordinator	
Lecturer(s)	Asst. Prof. Osman Sinan SÜSLÜ
Assistant(s)	Rsh. Asst. Yusuf KARAKAŞ
Work Placement	No

Recommended or Required Reading	
Books / Lecture Notes	Y. A. Çengel: Thermodynamics: An Engineering Approach
Other Sources	P. Stephan, K.-H. Schaber, K. Stephan, F. Mayinger: Thermodynamik, Grundlagen und technische Anwendungen H. D. Baehr, S. Kabelac: Thermodynamik K. Lucas: Thermodynamik

Additional Course Material	
Documents	12 lecture notes
Assignments	6
Exams	2

Course Composition		
Mathematics und Basic Sciences	35	%
Engineering	30	%
Engineering Design	5	%
Social Sciences		%
Educational Sciences		%
Natural Sciences	30	%
Health Sciences		%
Expert Knowledge		%

Assessment		
Activity	**Count**	**Percentage (%)**
Midterm Exam	1	35%
Quiz		
Assignments	6	15%
Attendance		
Recitations		
Projects		
Final Exam	1	50%
	Total	**100**

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ECTS Points and Work Load			
Activity	**Count**	**Duration**	**Work Load (Hours)**
Lectures	14	3	42
Self-Study	14	6	84
Assignments	6	4	24
Presentation / Seminar Preparation			
Midterm Exam	1	3	3
Recitations	14	2	28
Laboratory			
Projects			
Final Exam	1	3	3
		Total Work Load	**184**
		ECTS Points (Total Work Load / Hours)	**6**

Learning Outcomes	
1	Students learn the Ideal gas approximation.
2	General knowledge about the laws of thermodynamics is gained.
3	They learn the properties of real and ideal gas.
4	Students learn thermodynamic cycles.
5	Students gain knowledge about ideal gas mixtures.
6	They have knowledge about combustion reactions.
7	Knowledge of the structure, working principle and calculation of compressors and turbines is gained.
8	They have knowledge about the structure, working principle and calculation of coolers and thermal power plants.

Weekly Content	
1	Fundamentals of thermodynamics
2	First law of thermodynamics
3	Second law of thermodynamics and entropy
4	Thermodynamic properties of fluids and Exergy
5	Ideal Gas
6	Ideal Gas Mixtures and Real Gases
7	Wet Steam
8	Midterm, Humid Air
9	Compressors

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10	Combustion
11	Turbines
12	Gas Power Cycles
13	Steam Power Cycles
14	Cooling Cycles
15	Final Exam

Contribution of Learning Outcomes to Program Objectives (1-5)

	P1	P2	P3	P4	P5	P6	P7
1	5	4	4	5	4	5	4
2	4	5	3	4	3	4	5
3	4	5	2	5	4	3	3
4	4	5	4	4	2	5	5
5	5	4	5	4	5	4	4
6	5	4	4	5	4	2	3
7	5	4	5	5	3	3	4
8	5	5	3	4	5	5	5

Contribution Level	1: Low 2: Low-intermediate 3: Intermediate 4: High 5: Very High

P1 Working with modern scientific sources.
P2 Having modern scientific knowledge and scientific analysis abilities and being able to apply them to scientific problems.
P3 Having theoretical and practical skills in the area of Energy Science and Technology.
P4 Having foreign language skills to follow the worldwide advancements in the field of Energy Science and Technology and to be able to discuss them with foreign colleagues.
P5 Having computational skills for research data analysis purposes.
P6 Having appropriate skills for academic and industrial jobs, being ready to take responsibility in working life.
P7 Having knowledge about work occupational work and safety.

Compiled by:	Asst. Prof. Osman Sinan SÜSLÜ
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